**SYLLABUS**
***MATHEMATICAL AND COMPUTATIONAL LOGICS***

1. **Information on academic programme**

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| 1.1. University | **„1 Decembrie 1918" University of Alba Iulia** |
| 1.2. Faculty | **Faculty of Exact Sciences and Engineering** |
| 1.3. Department | **Informatics, Mathematics and Applied Electronics** |
| 1.4. Field of Study | **Computer Science** |
| 1.5. Cycle of Study | **Undergraduate** |
| 1.6. Academic programme / Qualification | **Computer Science** |

2. **Information of Course Matter**

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| 2.1. **Course** | *Mathematical and computational logics* | | | 2.2. **Code** | | CSE 102 | |
| 2.3. **Course Leader** | Dorin Wainberg | | | | | | |
| 2.4. **Seminar Tutor** | Dorin Wainberg | | | | | | |
| 2.5. Academic Year | **I** | 2.6. Semester | **I** | 2.7. Type of Evaluation (E – final exam/ CE - colloquy examination / CA -continuous assessment) | **E** | 2.8. Type of course (**C**– Compulsory, **Op** – optional, **F** - Facultative) | **C** |

**3. Course Structure** (Weekly number of hours)

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|---|---|---|---|---|---|
| 3.1. Weekly number of hours | *3* | 3.2. course | *2* | 3.3. seminar, laboratory | *1* |
| 3.4. Total number of hours in the curriculum | *42* | 3.5. course | *28* | 3.6. seminar, laboratory | *14* |

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| Allocation of time: | Hours |
| Individual study of readers | *30* |
| Documentation (library) | *12* |
| Home assignments, Essays, Portfolios | *14* |
| Tutorials | - |
| Assessment (examinations) | *2* |
| Other activities……. | - |

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| 3.7 Total number of hours for individual study | 58 |
| 3.9 Total number of hours per semester | 100 |
| 3.10 Number of ECTS | 4 |

**4. Prerequisites** (*where applicable*)

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| 4.1. curriculum-based | - |
| 4.2. competence-based | - |

**5. Requisites** (*where applicable*)

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| 5.1. course-related | Room equipped with video projector / board |
| 5.2. seminar/laboratory-based | Room equipped with video projector / board |

## 6. Specific competences to be acquired (chosen by the course leader from the programme general competences grid)

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| Professional competences | C4 The use of the theoretical basis of computer science and of formal models<br>C4.1 The definition of base concepts and principles of computer science and mathematics as well as of the mathematical theories and models.<br>C4.2 The interpretation of mathematical and computer science (formal) models.<br>C4.3 The identification of appropriate models and methods for solving real-life problems.<br>C4.4 The use of simulation in the study of the behavior of developed models and evaluation of results.<br>C4.5 The embedding of formal models in specific applications in various domains. |
| Transversal competences | - |

## 7. Course objectives (as per the programme specific competences grid)

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| 7.1 General objectives of the course | The discipline Computational logics aims to provide students opportunities to identify and use knowledge of the laws of human reasoning, for the purposes of mastering proper expertise and especially for their enforcement in the areas of artificial intelligence, analysis and synthesis of logic circuits, the automatic demonstration theorems, the logic programming. |
| 7.2 Specific objectives of the course | Acquiring fundamental knowledge concerning the discipline specific concepts: formal systems, judgments and sentences, modal logic elements, probability, predicate logic elements; training in problem solving skills necessary for circuit design and optimization of computer systems based on structural formulas, representing information in memory computer systems. |

## 8. Course contents

| **8.1 Course (learning units)** | **Teaching methods** | **Remarks** |
|---|---|---|
| 1. Propositional Logic: Logical operations, Logical equivalence of formulas, Duality law | ***Lecture, conversation, exemplification*** | 2 |
| 2. Decision Problem. Perfect normal forms. | ***Lecture, conversation, exemplification*** | 2 |
| 3. Propositional calculus elements: The concept of formula. True formulas | ***Lecture, conversation, exemplification*** | 2 |
| 4. Deduction theorem. Rules of propositional calculus. | ***Lecture, conversation, exemplification*** | 2 |
| 5. Logically equivalent formulas. Deductibility theorems. Formulas in propositional algebra and propositional calculus. | ***Lecture, conversation, exemplification*** | 2 |
| 6. No contradiction and completeness of propositional calculus. Independence of propositional calculus axioms. | ***Lecture, conversation, exemplification*** | 2 |
| 7. Predicate calculus: Definitions of predicates and quantifiers. Normal forms. | ***Lecture, conversation, exemplification*** | 2 |
| 8. Predicate calculus formulas and axioms. | ***Lecture, conversation, exemplification*** | 2 |
| 9. Noncontradiction and narrowly completeness of predicate calculus. Theorems of predicate calculus. | ***Lecture, conversation, exemplification*** | 2 |
| 10. Equivalent formulas in predicate calculus. Axioms of predicate calculus. | ***Lecture, conversation, exemplification*** | 2 |

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| 11. Numeral: positional representation of numbers, algorithms for crossing a number from one base to another, the four operations in various numeral, numeral 2, 8, 16; characteristic elements. | ***Lecture, conversation, exemplification*** | 2 |
| 12. Representation of numerical information in memory computer systems: fixed-point representation of numerical information, floating point representation of numerical information, arithmetic operations with floating point numbers, IEEE P754 Standard | ***Lecture, conversation, exemplification*** | 2 |
| 13. Boolean functions and their realization: the notion of Boolean function of several variables, Boolean operations AND, OR, NOT | ***Lecture, conversation, exemplification*** | 2 |
| 14. The operation of AND gate, OR gate, NOT gate circuits; Implementation of Boolean functions. Boolean functions applications | ***Lecture, conversation, exemplification*** | 2 |
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| **Seminars-laboratories** | **Teaching methods** | |
| 1 Logic sentences – applications | ***Laboratory activities, exemplification, conversation*** | 2 |
| 2. Elements of propositional calculus – applications | ***Laboratory activities, exemplification, conversation*** | 2 |
| 3. Predicate calculus – applications | ***Laboratory activities, exemplification, conversation*** | 2 |
| 4. Numeral – applications | ***Laboratory activities, exemplification, conversation*** | 2 |
| 5. Representation of numerical information in memory computer systems – applications | ***Laboratory activities, exemplification, conversation*** | 2 |
| 6. Boolean functions and their realization | ***Laboratory activities, exemplification, conversation*** | 4 |

**References**


- Mihaela Malita, Mircea Malita, *Bazele inteligenţei artificiale,* Ed. Tehnică, 1987.
- Teodor Stihi, *Introducere in logica simbolica,* Ed. BIC ALL, Bucuresti 1999;
- Nicolae Tandareanu, *Introducere in Inteligenta Artificiala. Limbajul Prolog,* Editura Intarf, 1994.
- Ion Iancu, *Sisteme rezolutive*, Editura Universitaria, Craiova, 2003
- Michael R. Genesereth, Nils J. Nislsson, *Logical Foundations of Artificial Intelligence*, Morgan Kaufmann Publishers, 1988
- S. Russell and P. Norvig, *Artificial Intelligence. A Modern Approach*, Prentice Hall, 1995
- Moise Cocan, Bogdana Pop, *Logica computationala,* Ed. Albastra, Cluj-Napoca, 2006
- Gh. Stefan, V. Bistriceanu, *Circuite integrate digitale – probleme – proiectare,* Ed. Albastra, Cluj-Napoca, 2000
- Boian F., *Sisteme de operare interactive,* Ed. Libris, 1994
- Aldea M., *Logica computationala,* Seria Didactica, Alba Iulia, 2009.


## 9. Corroboration of course contents with the expectations of the epistemic community's significant representatives, professional associations and employers in the field of the academic programme

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**10. Assessment**

| Activity | 10.1 Evaluation criteria | 10.2 Evaluation methods | 10.3 Percentage of final grade |
|---|---|---|---|
| 10.4 Course | *Final evaluation* | *Written paper/oral exam* | 50% |
| | - | - | - |
| 10.5 Seminar/laboratory | *Continuous assessment* | *Tests* | 50% |
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| 10.6 Minimum performance standard: a minimum grade of 5 | | | |
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Submission date
21.09.2021

Course leader signature

Seminar tutor signature

Date of approval by Department members

Department director signature